

Study Guide for Exam 2

This list is fairly thorough, but is not exhaustive - it is meant to give you an idea of the kind of questions or topics that might be on the exam, but it does not cover all of the possible questions or topics. Note that the exam will cover all material from Units II and III on the syllabus.

- 1) There will be a matching section like the following, in which you will need to match each description in the right column with the insect or non-insect hexapod order in the left column that best matches it (THESE ARE JUST EXAMPLES, TO ILLUSTRATE THE LEVEL OF DETAIL FOR EACH ORDER THAT YOU WILL BE EXPECTED TO MASTER). To prepare for this section, be sure you are familiar with the basic distinguishing features of each order.

A. Archaeognatha	_____	Predatory aquatic immatures with
B. Blattodea		rectal gills, extendable labium.
C. Coleoptera		
D. Collembola	_____	Aquatic larvae, adults with hairy wings.
E. Dermaptera		
F. Diplura	_____	Endopterygote order in which many species
G. Diptera		are social, many others are parasitoids.
H. Ephemeroptera		
I. Embioptera	_____	The only order in which individuals molt
J. Grylloblattodea		after having flight-capable wings.
K. Hemiptera		
L. Hymenoptera	_____	Hemimetabolous social insects that exchange
M. Isoptera		gut symbionts via trophallaxis.
N. Lepidoptera		
O. Mantodea	_____	Front wings reduced to halteres, parasitic on
P. Mecoptera		other insects.
Q. Megaloptera		
R. Mantophasmatodea	_____	Wingless, mandibulate insects restricted to
S. Neuroptera		very cold places.
T. Odonata		
U. Orthoptera	_____	Tiny, haustellate insects with wings that are
V. Phasmatodea		fringed with long hairs.
W. Phthiraptera		
X. Protura	_____	Front legs modified into sensory structures,
Y. Plecoptera		making up for the lack of antennae.

Z. Raphidioptera		
Ω. Strepsiptera	_____	Leathery front wings, eggs in ootheca, legs built for running.
£. Thysanoptera		
Σ. Trichoptera		
Ψ. Zygentoma	_____	Largest order of mandibulate, hemimetab. insects.
	_____	Apterygotes with vestiges of abdominal legs.

- 2) What traits are generally regarded as the basic evolutionary innovations that led to the rise of insects? Why are these thought to be important?
- 3) Why are some groups, like the Endopterygota and Neoptera considered to be true evolutionary groups, while others, like the Exopterygota and Palaeoptera are not?
- 4) Describe the different ways by which insects eat plants. What are the consequences of these different feeding styles for the insects that use them, in terms of nutrition, defense against enemies, and diet breadth? Which orders account for the majority of herbivorous insects?
- 5) Why do architecturally complex plants harbor a greater diversity of herbivorous insects than do simpler plants?
- 6) In what ways does herbivory present difficult physical challenges to insects?
- 7) Explain the difference between quantitative chemical defenses and qualitative defenses, both with respect to plant investment and effects on insects. According to apparency theory, which plants should mainly deploy qualitative defenses? Why? What does the tissue-value theory predict? What kinds of evidence is used to support these theories?
- 8) What counterplays to plant defenses have insects evolved?
- 9) Outline the basic logic of Ehrlich and Raven's theory of coevolution. Describe examples of evidence supporting this theory.
- 10) What are the similarities and differences between predatory insects and insect parasitoids, in terms of how they attack other insects and what cues they use to find those insects? Why are parasitoids more diverse than predatory insects?
- 11) What are the different types of social parasitism?

- 12) What are some of the common types of primary defense mechanisms used by insects against natural enemies? What about secondary defense mechanisms?
- 13) What is the difference between Batesian and Mullerian mimicry?
- 14) Why are ants often involved in mutualistic associations? What is the basic currency used to pay ants for their services?
- 15) What do plants and their insect mutualists get from the associations we discussed in class?
- 16) In which orders do we find the bulk of aquatic insect diversity?
- 17) Why is gas exchange a problem for aquatic insects? What mechanisms have they evolved for dealing with this problem?
- 18) What are lotic and lentic habitats? Within lentic habitats, what are the differences between littoral, limnetic, and profundal habitats? How do these differences influence insects? Similarly, describe how habitat quality may depend on whether insects are in eutrophic or oligotrophic water.
- 19) In lotic habitats, what factors influence substrate particle size? What is meant by stream order? What is the River Continuum Concept? How does this concept help us predict the dominant feeding category of insects at a particular stretch of a stream or river?
- 20) What is biomonitoring? What is the advantage of using insects (as opposed to other groups) for biomonitoring research? In what ways can deforestation and urbanization influence stream habitats? How do insects respond to these changes? How can insects be used as indicators of biodiversity in other groups?
- 21) What are the advantages of flight? What are the advantages of flightlessness? In what kinds of environments would you expect to see one or the other?
- 22) What are the theories for the origin of insect wings? Why has it been such a challenge to narrow down this list of theories?
- 23) What are the different categories of social organization? How do they differ from one another? How does the organization of termite colonies differ from that of bees? What are the main theories to explain the evolution of eusociality?

24) What are the main goals in the control of pest insects? What are the benefits and drawbacks of chemical control and biological control? What are the alternatives? What is integrated pest management, and how is it performed?